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FORM PTO-1390 (REV. 11-94) **TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)**	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 10806-004 **09/806781**
INTERNATIONAL APPLICATION NO. PCT/SE99/01799	INTERNATIONAL FILING DATE October 7, 1999	PRIORITY DATE CLAIMED October 7, 1998

TITLE OF INVENTION
METHOD AND APPARATUS FOR PROVIDING ROUTING IN A CIRCUIT SWITCHED NETWORK

APPLICANT(S) FOR DO/EO/US
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Applicant herewith submits to the United States Designated/ Elected Office (DO/EO/US) the following items under 35 U.S.C. 371:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.

2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.

3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).

4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
    a. ☐ is transmitted herewith (required only if not transmitted by the international Bureau).
    b. ☒ has been transmitted by the International Bureau.
    c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)

6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
    a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
    b. ☐ have been transmitted by the International Bureaus.
    c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
    d. ☒ have not been made and will not be made.

8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 37(c)(3)).

9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (unexecuted)

10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items **11. to 16. below concern document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

13. ☐ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☐ A substitute specification.

15. ☐ A change of power of attorney and/or address letter.

16. ☐ Other items or information:

17. ☒ The U.S. National Fee (35 U.S.C. 371(c)(1)) and other fees as follows:

	CLAIMS			
(1)FOR	(2)NUMBER FILED	(3)NUMBER EXTRA	(4)RATE	(5)CALCULATIONS
TOTAL CLAIMS	19 - 20	0	X $ 18.00	$ 0.00
INDEPENDENT CLAIMS	2 - 3	0	X $ 80.00	0.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $ 270.00	$ 270.00

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):
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☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO . . . . $1000 $ 1,000.00

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b. ☒ Please charge Deposit Account No. 16-1150 in the amount of $ 635.00 to cover the above fees. A copy of this sheet is enclosed.

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18. ☐ Other instructions
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19. ☒ All correspondence for this application should be mailed to
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NEW YORK, NEW YORK 10036-2711

20. ☒ All telephone inquiries should be made to (212) 790-2803

Garland T. Stephens		37,242	3/30/01
NAME	SIGNATURE	REGISTRATION NUMBER	DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: ☒ Application of: Lindgren et al.
   ☐ Patent of:

☒ Application No.: TBA   Group Art Unit: TBA
☐ Patent No.:

☒ Filed: March 30, 2001   Examiner: TBA
☐ Issued:

For: METHOD AND APPARATUS FOR   Attorney Docket No.: 10806-004
PROVIDING ROUTING IN A CIRCUIT SWITCHED
NETWORK

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
[37 CFR 1.9(f) and 1.27(c)] - Small Business Concern

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I hereby declare that I am

   ☐ the owner of the small business concern identified below:
   ☒ an official of the small business concern empowered to act in behalf of
      the concern identified below:
   Name of organization Net Insight
   Address of organization P.O. Box 42093
                            SE-126 14 Stockholm
                            Sweden

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the person employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern and/or there is an obligation under contract or law by the inventor(s) to convey rights to the small business concern with regard to the invention entitled METHOD AND APPARATUS FOR PROVIDING ROUTING IN A CIRCUIT SWITCHED NETWORK by inventor(s) Lindgren et al. described in

   ☐ the specification filed herewith

☒ application no. TBA filed March 30, 2001
☐ patent no.   issued

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below and no rights to the invention are held by any person, other than the inventor, who could not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. [37 CFR 1.28 (b)]

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, and patent issuing thereon, or any patent to which this verified statement is directed.

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Name of person signing _____ BENGT OLSSON

Title of person other than owner _____ CEO

Address of person signing P.O. Box 4093, SE-126 14 Stockholm, Sweden

Signature _____ Date MAY 5, 2001

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

METHOD AND APPARATUS FOR PROVIDING ROUTING IN A CIRCUIT SWITCHED NETWORK

Technical Field of Invention

The present invention refers to a method and an apparatus for providing routing of asynchronous traffic in a circuit switched synchronous time division multi-
5   plexed network, more specifically in a DTM network.

Background of the invention

Today, new types of circuit-switched communication networks are being developed for the transfer of informa-
10   tion using synchronous time division multiplexed bit-streams. Within this field, a new technology, referred DTM (Dynamic synchronous Transfer Mode), are currently being developed, primarily addressing the problem of providing quality of service to users of real-time,
15   broadband applications.

The structure of a DTM network has been described in, e.g., "The DTM Gigabit Network", Christer Bohm, Per Lindgren, Lars Ramfelt, and Peter Sjödin, Journal of High Speed Networks, 3(2):109-126, 1994, and in "Multi-gigabit
20   networking based on DTM", Lars Gauffin, Lars Håkansson, and Björn Pehrson, Computer networks and ISDN Systems, 24(2):119-139, April 1992.

The basic topology of a DTM network is preferably a bus with two unidirectional, multi-access, multi-channel
25   optical fibers connecting a number of nodes. However, the topology may just as well be any other kind of structures e.g. a ring structure or a hub structure.

The bandwidth of each wavelength on the bus, i.e. each bitstream on each fiber, is divided into recurrent
30   fixed length frames, which in turn are divided into fixed size time slots. The number of slots in a frame thus depends on the network's bit-rate. The time slots are divided into two groups, control slots and data slots. Control slots are typically used for transferring of

signaling messages between said nodes for the network's
internal operation. The data slots are typically used for
the transfer of data between end users connected to the
different nodes.

5   Each node is arranged to dynamically establish, ter-
minate, and modify DTM channels by dynamically allocating
time slots thereto.

When DTM channels are used for transferring asyn-
chronous traffic, such as TCP/IP packets, a mechanism for
10   providing routing of said packets through the DTM network
is needed. However, current available routing solutions
are typically developed for use in other kinds of network
architectures and therefore suggest mechanism that
results in poor use of the advantageous aspects of a
15   network of the DTM kind.

It is therefore an object of the invention to pro-
vide a routing solution in a network of the DTM kind,
which make better use of the features of such a network.

20   Summary of the Invention
The above mentioned and other objects are achieved
by the invention as defined in the accompanying claims.
Hence, according to the invention, a multi-channel
multi-access bitstream carrying isochronous channels is
25   accessed, said isochronous channel being used for the
transfer of asynchronous traffic, and a data packet from
a node connected to said bitstream is received in an
isochronous channel thereof. Then, it is determined if
said data packet is to be transmitted to another node
30   connected to said bitstream using another channel of said
isochronous channels. If so, said data packet is trans-
mitted to said another node using said another channel of
said isochronous channels on said bitstream.
The invention thus provides routing of data packets
35   among isochronous channels of one and the same multi-
channel multi-access bitstream. Typically, in conven-
tional solutions, a router is provided to interconnect

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two or more separate networks or, network sections, and
to provide routing of data packets between such network
sections. The routing solution according to the invention
differs from this conventional approach in that routing
5   is provided among the channels of a single multi-channel
multi-access bitstream. Consequently, a routing mechanism
according to the invention, providing routing among chan-
nels of a single bitstream, need not be provided at an
exit point of the bitstream, i.e. at the point of inter-
10   connection to another bitstream. Note, however, that this
does not mean that a routing mechanism according to the
invention is limited to routing with respect to channels
of one single bitstream only, as one may use conventional
routing from said bitstream to another bitstream as well
15   without departing from the scope of the invention.
      The routing mechanism according to the invention
provides the network designer with a greater freedom of
architecture when designing networks. An example thereof
will be described below with reference to Fig. 5.
20   According to a preferred embodiment, channels of
said bitstream that are not to be routed by said routing
mechanism are not accessed by said routing mechanism.
Instead, such channels are bypassed, typically at the
interface of an apparatus providing said routing mecha-
25   nism. Consequently, the traffic in said bypassed channels
will be unattended and unaffected by said routing mecha-
nism. Of course, this requires the provision of means for
separating channels of said isochronous channels that are
to be received and channels that are not to be received.
30   However, according to an embodiment of the inven-
tion, if a data packet is received in a channel which
carries asynchronous traffic that is to be routed by the
routing apparatus but however also extends beyond the
routing apparatus, i.e. a mulicasted channel that isn't
35   set to terminate at the routing apparatus, further propa-
gation of said data packet to other nodes connected to
said bitstream using the isochronous channel from which

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said data packet was received is uninhibited. Consequen-
tly, as an example, a channel may be a multicast channel
wherein a data packet will reach a set of receivers, but
wherein said data packet will at the same time be routed
5   to another channel of said bitstream, for example to
reach another set of receivers.

    As mentioned in the introduction, a preferred use of
the invention is in a network operating according to a
Dynamic synchronous Transfer Mode (DTM) protocol, i.e. a
10   so called DTM network, said isochronous channels then
being DTM channels in said DTM network.

    For definition, as referred to herein, a "DTM net-
work" is a circuit switched time division multiplexed
network of the kind wherein information is transferred
15   between nodes of the network on bitstreams. Each bit-
stream is divided into regularly recurrent, essentially
fixed size frames, so called DTM frames, each comprising
a number of fixed size time slots, said time slots being
separated into control slots and data slots. Control
20   slots are used for control signaling between nodes of the
network, and data slots are used for the transfer of user
data (sometimes often referred to as payload data).

    Furthermore, in a DTM network, write access to the
time slots of a DTM frame is distributed among nodes
25   being attached to the bitstream carrying said DTM frame,
each node typically having write access to a respective
at least one control slot and a respective dynamically
adjustable set of data slots within each recurrent frame.
Moreover, having write access to a time slot position in
30   a frame means having write access to said time slot
position within each recurrent frame.

    In a DTM network, a node will use the data slots it
has write access to for establishing so called DTM chan-
nels by allocating one or more of said data slots to each
35   respective DTM channel. Hence, as referred to herein, a
DTM channel is defined by one or more time slots occupy-
ing the same time slot position within each DTM frame of

the bitstream upon which said DTM channel is carried.
However, if a DTM channel reaches, for example, over two
bitstreams, the channel may of course be defined by a
different set of time slot positions on the two bit-
5   streams. Also, a DTM channel may be either a control
channel or a data channel, depending on whether control
or data slots that is allocated to said channel. Further-
more, a DTM channel may be uni-, multi- or broadcast.
        As the demand for network capacity changes, DTM
10 channels may be dynamically established, terminated, or
modified, the latter by changing the number of time slots
allocated to a DTM channel. Also, the distribution of
write access to time slot among different nodes may be
dynamically modified as different nodes develop different
15 needs for control signaling and data transfer.
        According to another embodiment of the invention, a
routing mechanism according of the above mentioned kind
is performed in relation to a memory that provides tempo-
rary storing of data packets at memory locations thereof,
20 said memory locations being temporarily allocated for
storing respective data packets. This memory is then
accessed for storing/transmission of data packets irres-
pective of which channel a data packet is received upon/-
transmitted into, and is thus used as a shared memory
25 shared by all channels. This will provide a comparatively
simple design for managing data packets in relation to
multi-channel routing according to the invention.
        Further aspects and advantages of the invention will
be more fully understood by those skilled in the art from
30 the accompanying claims and from the following detailed
description of exemplifying embodiments thereof.

Brief Description of the Drawings
        Exemplifying embodiments of the invention will now
35 be described with reference to the accompanying drawings,
wherein:

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Fig. 1 shows en example of the structure of a bit-
stream in a DTM network;

Fig. 2 illustrates transfer of asynchronous traffic
in one of the isochronous channels carried by the
5   bitstream shown in Fig. 1;

Fig. 3 shows an exemplifying embodiment of an
apparatus according to the invention;

Fig. 4 shows another exemplifying embodiment of an
apparatus according to the invention; and

10   Fig. 5 shows a network comprising the apparatus
shown in Fig 4.

Detailed Description of an Exemplifying Embodiment

An example of the structure of a multi-channel
15   multi-access bitstream B in a circuit switched time
division multiplexed network operating according to a DTM
protocol will now be described with reference to Fig. 1.

As shown in Fig. 1, the bitstream B is divided into
recurrent, essentially fixed sized frames, wherein the
20   start of each frame is defined by a frame synchronization
time slot F and each frame ends with one or more guard
band time slots G.

Each frame is further divided into a plurality of
fixed sized, typically 64 bit, time slots. When using a
25   nominal frame duration of 125 μs, a time slot size of 64
bits, and a bit rate of 2Gbps, the total number of time
slots within each frame will be approximately 3900.

The time slots are divided into control slots C1,
C2, C3, and C4, and data slots D1, D2, D3, and D4. Write
30   access to the control and data slots are distributed
among the nodes connected to the bitstream. As an exam-
ple, in Fig. 1, a node N1 (connected to the bitstream B)
will have access to a control slot C1 and a set of data
slots D1 within each frame of the bitstream, a node N2
35   (also connected to the bitstream) will have access to a
control slot C2 and a set of data slots D2 within each
frame of the bitstream, and so on. The set of slots allo-

cated to a node as control slot(s) and/or data slot(s)
occupy the same slot position within each frame of the
bitstream. Hence, in the example, the control slot C1
belonging to node N1 will occupy the second time slot
5   within each frame of the bitstream.

During network operation, each node may increase or
decrease its access to control and/or data slots, thereby
re-distributing the access to control slots and/or data
slots among the nodes. For example, a node having a low
10   transfer capacity demand may give away its access to data
slots to a node having a higher transfer capacity demand.
Also, the slots allocated to a node need not be consecu-
tive slots, but may reside anywhere within the frame.

In Fig. 1 at (c), it is furthermore assumed that
15   node N2, having access to its control slot C2 and its
range of data slots D2, has established four channels
CH1, CH2, CH3, and CH4 on the bitstream. As shown, each
channel is allocated a respective set of slots. In the
example, the transfer capacity of channel CH1 is larger
20   than the transfer capacity of channel 2, since the number
of time slots allocated to channel CH1 is larger than the
number of time slots allocated to channel CH2. The time
slots allocated to a channel occupy the same time slot
positions within each recurrent frame of the bitstream.

25   An example of the transfer of asynchronous traffic
in one of the isochronous channels carried by the bit-
stream B shown in Fig. 1 will now be described with
reference to Fig. 2. In Fig. 2, it is assumed that the
channel CH3 shown in Fig. 1 is established to carry
30   asynchronous traffic in the form of sequentially trans-
mitted variable size data packets, which for example
could be TCP/IP packets or Ethernet frames. As channel
CH3 comprises seven time slots within each frame on
bitstream B, the first seven time slots transmitted in
35   the channel CH3, i.e. the first seven time slots in Fig.
2, will be transmitted in one frame, the next seven time
slots will be transmitted in the next frame, and so on.

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Fig. 2 shows three packets transmitted in channel
CH3. Each packet is encapsulated according to a predefi-
ned encapsulation protocol. In Fig. 2, it is assumed that
the encapsulation protocol defines that each packet shall
5   be divided into 64 bit data blocks (the size of a time
slot), that a start_of_packet slot S is to be added to
the start of each packet, and that an end_of_packet slot
E is to be added to the end of each packet, thereby
forming encapsulated packets P1, P2, and P3. In case of
10 gaps between packets, the bitstream is provided with so
called idle slots, identifying said gaps as not providing
valid data.

An embodiment of an apparatus according to the
invention will now be described with reference to Fig. 3.
15 In Fig. 3, the apparatus 110 comprises a port 111, which
in turn comprises an incoming channel interface 113 and
an outgoing channel interface 114 providing read and
write access, respectively, to a bitstream B, which for
example may be the bitstream B shown in Fig. 1. The in-
20 coming and outgoing channel interface will provide for
synchronization of the operation of the apparatus in
relation to the frame and slot rate on the bitstream B.

The incoming channel interface and the outgoing
channel interface are connected to an incoming channel
25 manager 115 and an outgoing channel manager 116, respec-
tively. The incoming channel manager 115 and the outgoing
channel manager 116 are both connected to a routing
processor 117, a shared memory 119, a buffer manager 120,
and a control unit 121. The routing processor 117 is in
30 turn connected to a routing memory 118.

In operation, the incoming channel interface 113
will receive (arrow 1) data packets from the channels
monitored by said interface, such as the encapsulated
TCP/IP packets on channel CH3 as shown in Fig. 2.
35 The incoming channel interface 113 will then for-
ward, with preserved sequential order, each received data
block forming said packet to the incoming channel manager

115 (arrow 2). Each block forwarded to the incoming chan-
nel manager 115 is accompanied by a channel identifier,
designating the channel from which it was received.

5   Having received sufficiently many data blocks at the
head end of a packet to be able to derive information
designating the size of the packet, the incoming channel
manager will send a request (arrow 3), containing the
size of the packet, to the buffer manager 120. The
request will thereby inform the buffer manager 120 that
10   the incoming channel manager 115 needs to store a packet
of the designated size in the shared memory 119.

The buffer manager 120 will then allocate an address
space of the shared memory 119 to said packet. The buffer
manager 120 will answer the request by returning (arrow
15   4) a start address corresponding to the start of said
address space to the incoming channel manager 115.

Having received said start address from the buffer
manager 120, the incoming channel manager will start
writing the data blocks forming the associated packet
20   into the shared memory 119 (arrow 5), starting at the
start address received from the buffer manager 120 and
incrementing the address one step for each data block
written into the shared memory 119.

At the same time, the incoming channel manager 115
25   sends the start address received from the buffer manager
120, along with the IP address designated in the header
of the packet, to the routing processor 117 (arrow 6).

Using the routing memory 118 (arrow 7), the routing
processor will, based upon the destination address recei-
30   ved from the incoming channel interface 115, determine
whether or not the associated packet is to be transmitted
from the outgoing channel interface 114 and, if so, which
outgoing channel that is to be used when transmitting
said packet.

35   Having determined an outgoing channel for the data
packet, the routing processor 117 will transmit a signal
to the outgoing channel manager 116 (arrow 8), containing

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a channel identifier and the start address received from
the incoming channel manager. The channel identifier
identifies the outgoing channel to be used when trans-
mitting the associated packet address, and the start
5   address designates where to read the associated packet
from in the shared memory 120.

     Having received the outgoing channel identifier and
the start address from the routing processor 117, the
outgoing channel manager 116 will access the shared
10   memory (arrow 9) and start reading (arrow 10) data blocks
forming the associated packet from the shared memory 119,
beginning at the start address received from the routing
processor 117 and incrementing the address one step for
each data block read from the shared memory 119.

15   At the same time, the outgoing channel manager 116
will continuously receive requests (arrow 11) for data
blocks for respective outgoing channels from the outgoing
channel interface 114, said request being sent from the
outgoing channel interface at the rate as time slots
20   allocated to the respective channel passes on the out-
going bitstream accessed via the outgoing channel inter-
face 114.

     As triggered by said requests for data blocks, when
said requests relates to a channel identified by the a
25   channel identifier received form the routing processor
117, the outgoing channel manager 116 will forward (arrow
12), with preserved sequential order, each data block of
the associated data packet, as read from the shared
memory 119 starting at the designated start address, to
30   the outgoing channel interface 114. The outgoing channel
interface 114 will then, in turn, forward (arrow 13) the
received data blocks to the respective channels on the
outgoing bitstream.

     Having read the last data block of a packet from the
35   shared memory 119, the outgoing channel manager 120 will
return (arrow 14) the associated start address, which was
received from the routing processor 117, to the buffer

manager 120. This will inform the buffer manager that the
processing of the packet stored at the address space
associated with said start address is complete and that
the buffer manager is now free to allocate said address
5   space to a new data packet received via the incoming
channel interface.

Furthermore, the control unit 121 will determine
which channels that are to be received by the incoming
channel interface 113, which will typically be those
10   channels use for transmission of data packets that need
routing by the routing processor 117. Channels that are
not to be directed to the routing processor 117, as
determined by the control unit 121, are bypassed at the
incoming/outgoing channel interface 113, 114 and are
15   consequently not processed by the routing processor.

Another embodiment of an apparatus according to the
invention will now be described with reference to Fig. 4.
In the apparatus shown in Fig. 4, the only difference
compared to the embodiment shown in Fig. 3 is that, in
20   Fig. 4, the incoming channel manager 115 is provided with
a cache memory 122. The cache memory 122 contains a list
of destination addresses for which no routing is needed
by the routing processor 117, as previously determined by
the routing processor. A received packet referring to an
25   address among said list of destination addresses shall
not be directed to the routing processor 117. The routing
processor will continuously update the content of the
cache memory 122.

Consequently, when receiving a packet, the incoming
30   channel manager 115 will compare the destination address
of the packet against the destination addresses contained
in the cache memory 122. If a match is found, the packet
will be discarded at the incoming channel manager and
will hence not be directed to the routing processor 117,
35   thereby decreasing the processing load on the routing
processor 117.

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Note, however, that if the channel from which said
data packet was received does not terminate at the
apparatus 110 but instead continuos to one or more other
downstream nodes, e.g. if the channel is a multicast or
5   broadcast channel, the packet may be forwarded to down-
stream nodes in the same channel as it was received
irrespective of whether or not it is discarded at the
incoming channel manager. Whether or not this bypassing
is done at the incoming/outgoing channel interfaces 113,
10 114 or at the incoming/outgoing channel managers 115, 116
will typically be determined by the control unit 121.

A network utilizing the invention will now be des-
cribed with reference to Fig. 5. In Fig. 5, an multi-
channel multi-access bitstream B, which for example may
15 be the bitstream B shown in the previous figures, forms a
closed loop link connecting a plurality of access nodes A
using circuit switched time division multiplexing accor-
ding to a DTM protocol. A switch node S connected to the
link provides connectivity between said link and another
20 link that also uses circuit switched time division multi-
plexing according to said DTM protocol. On the latter
link, a router R provides access to a packet switched
network, such as the Internet. Furthermore, an apparatus
110 according to the invention, e.g. the apparatus des-
25 cribed with reference to Fig. 3 or Fig. 4, is connected
to the bitstream B.

In Fig. 5, the node apparatus 110 will typically
have established an isochronous channel to the router R
via the switch S. When an end user attached to an access
30 node A on the bitstream B wants to send a packet, it may
establish a channel to the appropriate destination on its
own decision, for example a channel to another access
node on the bitstream B or a channel to the router R via
the switch S. However, it may also use a channel to the
35 node apparatus 110, which will then, having received the
packet, see to that the packet is forwarded to the appro-

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priate destination, for example via a channel to the
router R.

According to an alternative embodiment, multicast
channels are established from each node connected to the
5   bitstream B to all other nodes connected to the bitstream
B. If an end user attached to an access node A on the
bitstream B wants to send a packet to any destination, it
will then simply multicast the packet using said multi-
cast channel. As the multicasted packet is read at the
10 nodes receiving said multicast channel, if it turns out
that the destination address of the packet refers to an
end user connected to another access node on said bit-
stream, said another node will see to that the packet is
forwarded to said end user. However, if it turns out that
15 the destination address of the packet refers to an end
user not connected to via an access node to said bit-
stream, the node apparatus 110 will see to that the
packet is forwarded to the appropriate destination, for
example via a point-to-point channel to the router R.

20   Even though the invention has been described above
with reference to exemplifying embodiments thereof, these
are not to be considered as limiting the scope of the
invention. Consequently, as understood by those skilled
in the art, different modifications, combinations and
25 alterations may be made within the scope of the inven-
tion, which is defined by the accompanying claims.

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CLAIMS

1. A method for providing routing of asynchronous
traffic in a circuit switched synchronous time division
5 multiplexed network, said method comprising the steps of:
receiving, in an isochronous channel of a multi-
channel multi-access bitstream carrying isochronous
channels, said isochronous channel being used for the
transfer of asynchronous traffic, a data packet from a
10 node connected to said bitstream;
determining if said data packet is to be transmitted
to another node connected to said bitstream using another
channel of said isochronous channels; and, if so,
transmitting said data packet to said another node
15 using said another channel of said isochronous channels
on said bitstream.

2. A method as claimed in claim 1, comprising the
steps of determining which channels of said isochronous
20 channels that are to be received and bypassing those
channels that are not to be received.

3. A method as claimed in claim 1 or 2, comprising
the step of discarding said data packet if said data
25 packet is not to be transmitted to another node connected
to said bitstream using another channel of said
isochronous channels.

4. A method as claimed in claim 1, 2, or 3, wherein
30 further propagation of said data packet to other nodes
connected to said bitstream using the isochronous channel
from which said data packet was received is uninhibited.

5. A method as claimed in claim 1, 2, 3, or 4,
35 wherein said data packet, when transmitted within said
channel, is encapsulated according to a predefined
encapsulation protocol.

15

6. A method as claimed in any one of the preceding claims, wherein said steps are performed at a node connected to said multi-channel multi-access bitstream.

5

7. A method as claimed in any one of the preceding claims, wherein said steps are performed at a node which provides routing of data packets only among channels carried by said multi-channel multi-access bitstream.

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8. A method as claimed in any one of the preceding claims, wherein said network is operating according to a Dynamic synchronous Transfer Mode (DTM) protocol.

15

9. A method as claimed in any one of the preceding claims, wherein said receiving step comprises temporarily allocating a location of a shared memory for storing said data packet and temporarily storing said data packet at said location of said shared memory, and wherein said

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transmitting step comprises reading said data packet from said location of said shared memory.

10. An apparatus (110) providing routing of asynchronous traffic in a circuit switched synchronous

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time division multiplexed network, comprising:

an interface (111) providing access to a multi-- channel multi-access bitstream carrying isochronous channels; and

routing means (117) for determining if a data packet

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received by said interface in an isochronous channel of said isochronous channels, said isochronous channel carrying asynchronous traffic, is to be transmitted using another one of said isochronous channels and, if so, directing said data packet thereto via said interface.

35

11. An apparatus as claimed in claim 10, comprising means for determining which channels of said isochronous

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channels that are to be received by said interface and
which channels that are to be bypassed at said interface.

    12. An apparatus as claimed in claim 10 or 11,
5   wherein said interface means comprises means (122) for
    determining if said data packet is not to be transmitted
    using another one of said isochronous channels and, if
    so, preventing said data packet from being processed by
    said routing means.
10

    13. An apparatus as claimed in claim 10, 11, or 12,
    wherein said interface is arranged to forward said data
    packet using the isochronous channel from which said data
    packet was received in addition to the decisions made by
15 said determining means.

    14. An apparatus as claimed in claim 10, 11, 12, or
    13, wherein said data packet, when transmitted within
    said channel, is encapsulated according to a predefined
20 encapsulation protocol.

    15. An apparatus as claimed in any one of claims 10-
    14, wherein said routing means provides routing of data
    packets only among channels carried by said multi-channel
25 multi-access bitstream.

    16. An apparatus as claimed in any one of claims 10-
    15, wherein said network is operating according to a
    Dynamic synchronous Transfer Mode (DTM) protocol.
30

    17. An apparatus as claimed in any one of claims 10-
    16, further comprising a memory (119) for temporarily
    storing said data packet at a memory location thereof,
    said memory location being temporarily allocated for
35 storing said data packet, wherein said interface is
    arranged to write said data packet into said allocated
    memory location when receiving said data packet and to

read said data packet from said allocated memory location
when transmitting said data packet.

5   18. An apparatus as claimed in claim 17, further
comprising a storage manager (120) being arranged to
temporarily allocate a memory location for storing said
data packet and to provide said interface with informa-
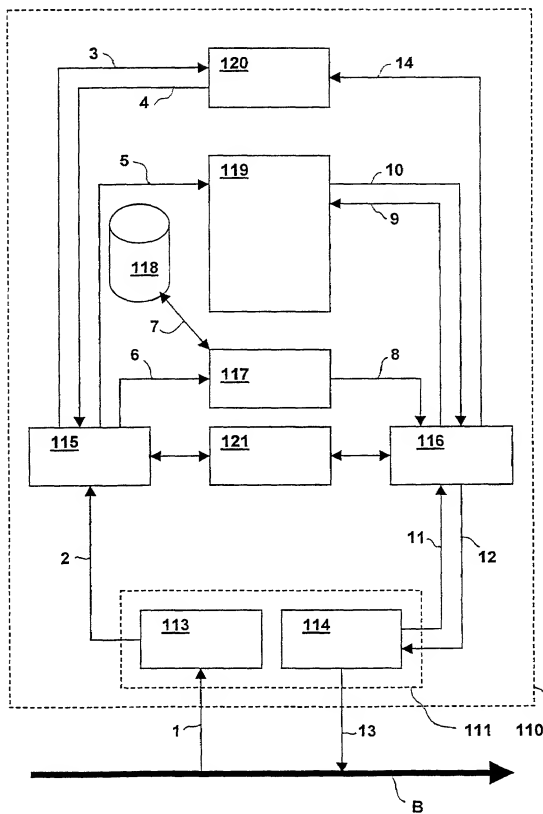tion designating said memory location for storing said
data packet.

10

        19. An apparatus as claimed in claim 17 or 18,
wherein said memory location is allocated for storing
said data packet as a result of a request made by said
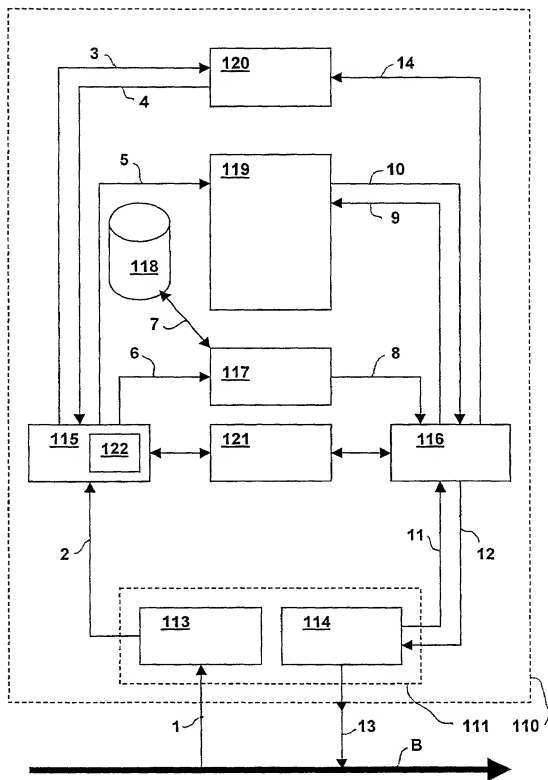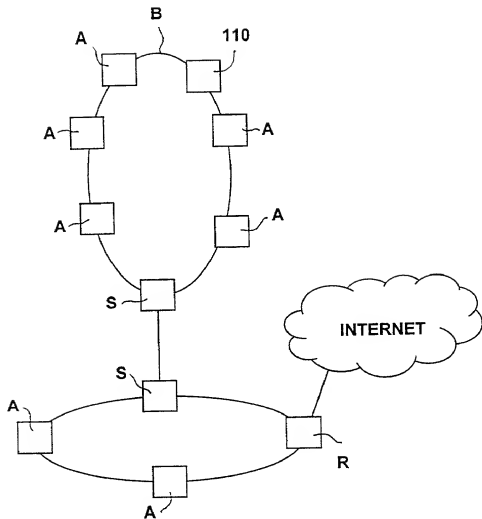interface when receiving said data packet.

15
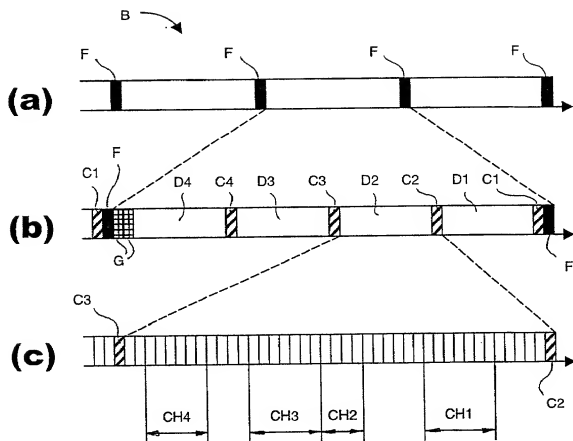
Fig. 1
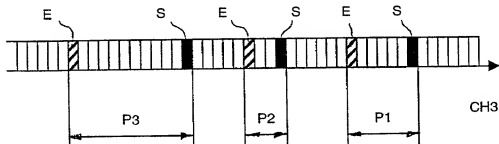
Fig. 2

Fig. 3

Fig. 4

Fig. 5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Per Lindgren, Christer Bohm, and Bengt Olsson

Application No.: TBA	Group Art Unit: TBA
Filed: March 30, 2001	Examiner: TBA
For: METHOD AND APPARATUS FOR PROVIDING ROUTING IN A CIRCUIT SWITCHED NETWORK	Attorney Docket No.: 10806-004

POWER OF ATTORNEY BY ASSIGNEE
AND EXCLUSION OF INVENTOR(S) UNDER 37 C.F.R. 3.71

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

        The undersigned assignee of the entire interest in the above-identified subject application hereby appoints: S. Leslie Misrock (Reg. No. 18872), Berj A. Terzian (Reg. No. 20060), David Weild, III (Reg. No. 21094), Jonathan A. Marshall (Reg. No. 24614), Barry D. Rein (Reg. No. 22411), Stanton T. Lawrence, III (Reg. No. 25736), Charles E. McKenney (Reg. No. 22795), Philip T. Shannon (Reg. No. 24278), Francis E. Morris (Reg. No. 24615), Charles E. Miller (Reg. No. 24576), Gidon D. Stern (Reg. No. 27469), John J. Lauter, Jr. (Reg. No. 27814), Brian M. Poissant (Reg. No. 28462), Brian D. Coggio (Reg. No. 27624), Rory J. Radding (Reg. No. 28749), Stephen J. Harbulak (Reg. No. 29166), Donald J. Goodell (Reg. No. 19766), James N. Palik (Reg. No. 25510), Thomas E. Friebel (Reg. No. 29258), Laura A. Coruzzi (Reg. No. 30742), Jennifer Gordon (Reg. No. 30753), Geraldine F. Baldwin (Reg. No. 31232), Victor N. Balancia (Reg. No. 31231), Samuel B. Abrams (Reg. No. 30605), Steven I. Wallach (Reg. No. 35402), Marcia H. Sundeen (Reg. No. 30893), Paul J. Zegger (Reg. No. 33821), Edmond R. Bannon (Reg. No. 32110), Bruce J. Barker (Reg. No. 33291), Adriane M. Antler (Reg. No. 32605), Thomas G. Rowan (Reg. No. 34419), James G. Markey (Reg. No. 31636), Thomas D. Kohler (Reg. No. 32797), Scott D. Stimpson (Reg. No. 33607), Gary S. Williams (Reg. No. 31066), Ann L. Gisolfi (Reg. No. 31956), Todd A.

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[ ] An assignment of the entire interest in the above-identified subject application was recorded on _____ at reel/frame _/_____.

[ ] An assignment of the entire interest in the above-identified subject application is submitted herewith for recording.

[x] A copy of an assignment of the entire interest in the above-identified subject application is submitted herewith. The assignment will be duly recorded.

Please direct all correspondence for this application to customer no. 20583.

ASSIGNEE: NET INSIGHT AB

Signature: _____

Typed Name: BENGT OLSSON

Position/Title: CEO

Address: P.O. Box 42093

                 SE-126 14 Stockholm, Sweden

Date: MAY 5, 2001

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NY2 - 1185923.1

ASSIGNMENT

WHEREAS, WE, Per Lindgren, Christer Bohm, and Bengt J. Olsson, ASSIGNORS, citizens of the Sweden, residing at Maria Prästgårdsgata 12, SE-118 52 Stockholm, Sweden; Skurusundsvägen 40, SE-131 46 Nacka, Sweden; and Rådjursvägen 303, SE-147 34 Tumba, Sweden, respectively, are the inventors of the invention in METHOD AND APPARATUS FOR PROVIDING ROUTING IN A CIRCUIT SWITCHED NETWORK for which we have executed an application for a Patent of the United States

☐   which is executed on   ☐   even date herewith or   ☐   _____

☒   which is identified by Pennie & Edmonds ᴸᴸᴾ docket no. 10806-004
☒   which was filed on March 30, 2001, Application No. TBA

and WHEREAS, Net Insight AB, ASSIGNEE, a corporation organized under the laws of Sweden, is desirous of obtaining our entire right, title and interest in, to and under the said invention and the said application:

NOW, THEREFORE, in consideration of the sum of One Dollar ($1.00) to us in hand paid, and other good and valuable consideration, the receipt of which is hereby acknowledged, we, the said ASSIGNORS, have sold, assigned, transferred and set over, and by these presents do hereby sell, assign, transfer and set over, unto the said ASSIGNEE, its successors, legal representatives and assigns, our entire right, title and interest in, to and under the said invention, and the said United States application and all divisions, renewals and continuations thereof, and all Patents of the United States which may be granted thereon and all reissues and extensions thereof; and all applications for industrial property protection, including, without limitation, all applications for patents, utility models, and designs which may hereafter be filed for said invention in any country or countries foreign to the United States, together with the right to file such applications and the right to claim for the same the priority rights derived from said United States application under the Patent Laws of the United States, the International Convention for the Protection of Industrial Property, or any other international agreement or the domestic laws of the country in which any such application is filed, as may be applicable; and all forms of industrial property protection, including, without limitation, patents, utility models, inventors' certificates and designs which may be granted for said invention in any country or countries foreign to the United States and all extensions, renewals and reissues thereof;

AND WE HEREBY authorize and request the Commissioner of Patents and Trademarks of the United States, and any Official of any country or countries foreign to the United States, whose duty it is to issue patents or other evidence or forms of industrial property protection on applications as aforesaid, to issue the same to the said ASSIGNEE, its successors, legal representatives and assigns, in accordance with the terms of this instrument.

AND WE HEREBY covenant and agree that we have full right to convey the entire interest herein assigned, and that we have not executed, and will not execute, any agreement in conflict herewith.

AND WE HEREBY further covenant and agree that we will communicate to the said ASSIGNEE, its successors, legal representatives and assigns, any facts known to us respecting said invention, and testify in any legal proceeding, sign all lawful papers, execute all divisional, continuing, reissue and foreign applications, make all rightful oaths, and generally do everything possible to aid the said ASSIGNEE, its successors, legal representatives and assigns, to obtain and enforce proper protection for said invention in all countries.

IN TESTIMONY WHEREOF, We hereunto set our hands and seals the day and year set opposite our respective signatures.

Date _May 3_____, 2001   _____L.S.
                              Per Lindgren   (Signature)

On this _3_ day of ____May_____, 2001, before me, a witness, personally appeared Per Lindgren, to me known and known to me to be the person of that name, who signed the foregoing instrument, and he acknowledged the same to be his free act and deed.

                              _____
                                                                      Witness

Date_____2/5_____, 2001   _____L.S.
                              Christer Bohm   (Signature)

On this _2_ day of ____May_____, 2001, before me, a witness, personally appeared Christer Bohm, to me known and known to me to be the person of that name, who signed the foregoing instrument, and he acknowledged the same to be his free act and deed.

                              _____
                                                                      Witness

Date _____ May 3 _____, 2001 _____ *Bengt J. Olm* _____ L.S.

Bengt J. Olsson   (Signature)

On this 3 day of _____ May _____, 2001, before me, a witness, personally appeared Bengt J. Olsson to me known and known to me to be the person of that name, who signed the foregoing instrument, and he acknowledged the same to be his free act and deed.

_____ Witness

JUN 2 8 2001

DECLARATION FOR NON-PROVISIONAL PATENT APPLICATION*

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below at 201 et seq. beneath my name.

I believe I am the original, first and sole inventor if only one name is listed at 201 below, or an original, first and joint inventor if plural names are listed at 201 et seq. below, of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND APPARATUS FOR PROVIDING ROUTING IN A CIRCUIT SWITCHED NETWORK

and for which a patent application:
☐ is attached hereto and includes amendment(s) filed on *(if applicable)*
☒ was filed in the United States on March 30, 2001 as Application No. TBA
☒ was filed as PCT international Application No. PCT/SE99/01799 on October 7, 1999

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

EARLIEST FOREIGN APPLICATION(S), IF ANY, FILED PRIOR TO THE FILING DATE OF THE APPLICATION			
APPLICATION NUMBER	COUNTRY	DATE OF FILING (day, month, year)	PRIORITY CLAIMED
9803418-4	Sweden	October 7, 1998	YES ☒ NO ☐
PCT/SE99/01799	PCT	October 7, 1999	YES ☒ NO ☐
			YES ☐ NO ☐

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.

PROVISIONAL APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

NON-PROVISIONAL APPLICATION SERIAL NO.	FILING DATE	STATUS		
		PATENTED	PENDING	ABANDONED

* for use only when the application is assigned to a company, partnership or other organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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	SIGNATURE OF INVENTOR 202		DATE 9/5 -01	

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